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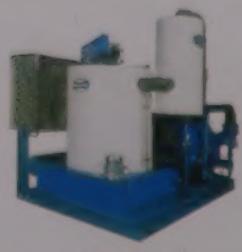
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Export Certification System For Marine Products

Ms. Shashi Sareen
Director, Export Inspection Council of India

INTRODUCTION

For sound development of export trade through Quality Control and Inspection, the Govt, of India enacted the Export (Quality Control & Inspection) Act, 1963 which came into force in the year 1964. The Act empowers the Central Government to notify commodities and their minimum standards for export, generally international standards or standards of the importing countries and to set up a suitable machinery for inspection and quality control. Accordingly the Export Inspection Council (EIC) was established as an advisory body to the government and an export inspection and certification machinery was instituted in the form of Export Inspection Agencies at Delhi, Kolkota, Kochi, Chennai and Mumbai with 45 sub offices and laboratories to provide back up.

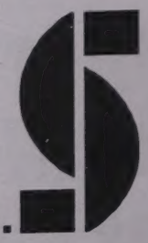
Over the years, under the provision of the Act, nearly !000 commodities were notified by the government for compulsory pre-shipment inspection and certification covering such sectors as chemicals, pesticides, rubber products, engineering products, food and agriculture products, textiles, footwear etc. The food items included basmati rice, black pepper, marine products, fruits and vegetables, egg products etc. Marine products were covered under compulsory inspection and certification since 1969. Initially, only frozen shrimps and canned shrimps were under the purview of statutory quality control and these products were covered under consignment wise inspection, a system of end product testing and inspection. However since 1977 a systems approach was followed in which control was exercised through all stages of processing, final production, storage and transportation.

However as a part of economic reforms in the early nineties, export certification procedures were simplified allowing various categories of exporters including trading houses, star trading houses, export houses; EOUs and units under Export Processing Zones (EPZs), Free Trade Zones (FTZs); IPQC units and exporters having a firm letter from overseas buyers that official Inspection was not required. Freedom of exports and pre-shipment inspection and certification by EIC was no longer a compulsory requirement. With these relaxations, the role of EIC/ EIAs in control of marine exports became negligible.

2. WTO SCENARIO

With the establishment of the WTO, the international scenario has changed rapidly with opportunities being available to all countries to benefit from greater access to world markets. Quality issues became important and with that the role of standards and legislation, especially those relating to safety and health. Emphasis on food safety and implementation of sanitary and phytosanitary measures by importing countries increased. Important safety issues in marine sector included microbiial contaminants, heavy metals, pesticide residues, toxins, antibiotic residues as well as additives including preservatives, emulsifiers, cryoprotectants and colouring material. Maximum limits were laid down by individual countries. At the international level, limits for such sanitary and phytosanitary measures were specified by Codex Alimentarius Commission.

To ensure that standards and regulations did not create unnecessary barriers to trade, certain rules and disciplines were required to be maintained, which were taken care of through the non-tariff agreements, especially the SPS Agreement. The SPS Agreement stresses on the health and safety aspects and permits member countries to impose measures to protect the health and safety of their population within certain rules. It also refers to use of Codex standards by member countries as baseline documents. In effect, member countries are free to install import control systems based on Codex standards and have an obligation to recognize the export certification of their trading partners provided it is equivalent to their import control system. The



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Codex standards also require official or officially recognized certification bodies and legislative framework for import/ export controls.

In the above scenario, export certification was once again made mandatory by the government for products like marine products, milk products, meat products and egg products due to the stringent health and safety requirements of the importing countries with a view to avoid rejections and EIC acquired greater relevance being the official export inspection and certification body in India with statutory status. The EC also recognized EIC as the Competent Authority for granting approval to the marine product processing units in India which meet the requirements of EC Directive 91/493/EEC and only units approved by EIC were permitted to export to the countries of the EU.

3. PRESENT EXPORT CERTIFICATION SYSTEM

Fresh, frozen and processed fish and fishery products are under compulsory Quality Control, inspection and monitoring vide notification dated 21 August 1995. EIC approves the units based on assessment of the units against the requirements prescribed in the Notification. The procedure followed for approving the units as well as ensuring continued compliance to the requirements is as given below.

3.1 System of Approval and renewals

The processor seeking approval, submits an application in a prescribed format alongwith relevant documents including the HACCP manual to the concerned Export Inspection Agency (EIA) of their region. Any discrepancies/shortcomings observed in the application are immediately communicated to the applicant for rectification. Assessment of the HACCP manual including SSOPs is carried out and any deficiencies or non-conformities observed are communicated to the applicant for rectification.

Once the documentation is in order, assessments are carried out by multi organisational teams at two levels; the Inter Departmental Panel (IDP) and Supervisory Audit Team (SAT) comprising EIA, MPEDA and CIFT officers. Deficiencies observed are communicated to the processor for taking corrective actions within an agreed time period, which after completion, are verified by an officer of EIA.

After clearance by SAT, the concerned EIA allots an approval number and recommends for approval to Export Inspection Council (EIC) along with a copy of the assessment report. EIC, after due consideration of the report, grants approval to the unit and issues a certificate of approval. The approval is valid for a period of two years and the processor is required to apply for approval two months before the expiry of the earlier approval. An IDP visit is carried out to assess the unit for renewal of approval and on the basis of this as well as the performance of the unit, a decision is taken to grant renewal.

3.2 Surveillance System

A 3-tier monitoring system is followed for surveillance as per details given below.

Monitoring visits

Once the approval is granted, regular monitoring of the unit is carried out by the officers of EIA every fortnight or less frequently, depending on the performance of the unit. Monitoring is carried out by verifying the records; the process controls including sanitation and hygiene; various parameters to check whether these are within the tolerance limits; drawing samples of raw material, water, ice, swabs, process/finished products etc. for independent testing for microbiological parameters; witnessing testing in case the same is in process. The factory vessels are monitored during berthing.

Non-conformities observed are filled in the Corrective Action Report (CAR) format and one copy provided to the processor for taking corrective actions/rectifications of deficiencies within an agreed time period (determined based on criticality of the deficiency). The monitoring report along with the CAR is submitted to the incharge of the sub-office or incharge of the Fish & Fishery Products scheme in Head Office, for follow up action, if any, and its acceptance.

Supervisory visit

Supervisory visits are carried out by an officer of the level of Deputy Director and above from the concerned Agency once every three months. The purpose of the Supervisory visit is to check compliance to the requirements of the system as well as the quality of monitoring carried out by the monitoring officers. Samples if any, drawn during such visits are sent to the laboratories for independent testing.

Corporate Audits

Audit of each Agency under the Corporate Audit mechanism is carried out at the frequency of once every year with the twin objective of checking compliance to and effectiveness of the system as well as building accountability. This comprises examination of records of processor maintained by the Agency like reports of visits, lab reports etc. to check compliance with the executive instructions and visit by the audit team to some of the approved units to assess them. Based on the corporate audit, the activities are further being streamlined.

3.3. Health Certification

Health certificate is issued by the concerned EIA on request, after satisfying itself that fish & fishery products are processed in an approved establishment/factory vessel having valid approval number and satisfying that the requirements of the standards are met.

3.4 Complaint Redressal Mechanism

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If complaints are received from any importer or government of an importing country relating to quality of product, these are investigated following a laid down systems which includes an on-the-spot visit to the processor to identify the cause of contamination as well as corrective actions required. in addition, the processor is placed on " On Alert" with increased monitoring and inspection of the consignments before exports. In case the processor is assessed to meeting the norms, "On Alert" is revoked, else, further action is taken which may include withdrawal of approval.

4. PRESENT STATUS OF EXPORTING UNITS

As on date, 113 processing units and 8 freezer vessels have been approved for processing Fish & Fishery Products for export to the countries of EU. Assessment of units is an ongoing process through a 2-stage assessment mechanism, the IDP & SAT. The units, which qualify for approval are added to the list of approved establishment and the list is forwarded to the EU periodically.

In addition, EIC has approved around 200 units, for processing F&FP for exporting marine products to countries other than EU. The basic differences in the requirements for the non EU countries is with regard to absence of facilities for pre-processing as well as own ice making unit. However these units are required to provide a linkage to the facilities from which their raw materials and ice are procured.

5. ISSUES OF CONCERN AS RELATED TO EU

5.0. EU is India's largest trading partner. it has also been a major importer of fish products from India. However it has been observed in the recent past, the industrial as well as the government has been conscious of the fact that there are certain basic issues hampering exports in this sector. Some of these issues are highlighted below.

5.1. Harmonization

One of the key elements of the Agreement on SPS is 'harmonization' in which member countries are to base their SPS measures on international standards setting organizations. It also means that within the EU member states there should be common norms followed. It has been observed that member countries are at times observing norms different to the common EC norms. During processing, an exporter may at times not be clear about the specific country of destination within the EU countries. As a result, while certifying the consignments of marine products for export to the countries of EU, it becomes difficult for Export Inspection Council to decide against which norms to certify which may in effect lead to rejection of the product.

In order to streamline exports of marine products from India to the countries of EU, it is considered necessary that the member countries of EU follow the common EC requirements in order to avoid any rejections due to lack of harmonisatinn of norms within EU member countries.

5.2. Transparency

To be able to meet the SPS requirements of various EU member countries, there is a need to have access to not only the common EC norms but also the specific additional norms of the member countries. It has been expressed by the Indian marine industry that there is dearth of information and lack of transparency on the diverse procedural norms and regulations of the EU member states as related to specifications as well as methods of sampling, inspection and test.

5.3. Delays in Procedure of Notification

Once a marine processing unit is approved by EIC, the Competent Authority for exports to the EU, it takes very long for the units to get notified by the EC. As a result of this export from the country are suffering. The procedures need to be shortened.

5.4. Retesting and Appeal Provisions

On rejection of consignments at the importing end, as per the procedure, these are at times brought back to the country of export. An assessment of these brought back consignments done has, at times, shown absence of contamination. The reasons for rejections are therefore not convincing and it is felt that probably rejections are due to other considerations. It is proposed that in case of rejections. a provision for joint testing and an appeal mechanism needs to be provided, with; if required, involvement of the Competent Authority.

5.5. Infrastructural requirements imposed by EC on India.

It is observed that on number of times, when European teams have visited the marine product processing establishments in India, they have communicated certain requirements such as flake ice machine, number of change rooms for employees, separate chill room in each section of the processing plants etc., whereas these requirements have not been mentioned in EC Directive 91/493/EEC. As a result, there is total confusion in the marine industry with regard to implementation of such directions issued by various delegations. Certain, amount of flexibility is required while following a systems approach as laid down in the notification, which needs to be done keeping in view the conditions prevalent in the country.

It is therefore necessary that the requirements laid down in EC Directive be followed by the industry with a certain amount of flexibility.

5.6. Data on rejections

On rejection of a consignment at the importing end, there is a lot of concern both by the countries of the EU as well as within the country for the reason of failing of consignment especially in

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view of the stringent surveillance system being implemented. It has also, at times, been expressed by the EC officials that the product should be 'free from bacteria' It is a well known fact that in a biological product, there is a chance of contamination and a product cannot be fully free from micro-organisms, Therefore, to be able to address the issue suitably, we would like to have information on the number and reasons of rejections of food items by EU for other countries. This would enable comparison of our rejection figures with those of other countries.

5.7. Issuance of Health Certificate retrospectively

While as a rule health certificates are issued before shipment of the consignments, but at times, due to unavoidable circumstances, the exporter may not be able to apply for the health certificate on time and the same may need to be issued retrospectively. EC does not accept Health Certificates issued retrospectively and they insist that health certificates are issued by the Competent Authority prior to shipment of the consignments.

In this connection, it may be mentioned that the Codex guidelines for 'generic official certificate formats, production and issuance of certificates' provide for issuance of certificates on retrospective basis if agreed by the competent authorities of the importing and exporting country. The clause in the Codex guidelines is as follows:

"Certificates may be issued while consignments are in transit to the country of destination only when appropriate systems of control are agreed by the Competent Authorities of the importing and exporting countries'

It is felt that such certificates might, at times, be issued retrospectively especially for consignments from exporters who were approved by the competent authority and are under the regular surveillance system.

5.8. Technical Assistance

Article 9 of the SPS Agreement provides for extending of technical assistance to developing country members to enable them to comply with the SPS measures needed to achieve the appropriate level of SPS protection in markets of the importing countries. To comply with requirements of EU member countries, such assistance is needed in areas of empowering our personnel by training in areas of HACCP; inspection, sampling and test methods; auditing procedures etc.

5.9. Equivalence agreement with individual countries

The SPS Agreement encourages members to accept the sanitary or phytosanitary measures of other members as equivalent through bilateral and multilateral Agreements provided the equivalence is demonstrated. Negotiating bilateral agreements is therefore an important means of facilitating trade by recognition of our systems by the importing country. This would ensure that duplication of testing at importing end is reduced and rejections with high cost of product recalls avoided. In View of increasing rejections by certain countries of the EU which are at times due to lack of transparency of norms etc it has become of paramount importance to have Equivalence Agreement between Export Inspection Council and the health authority of member countries of EU for marine products. Under such agreements it is proposed to cover exchange of information on standards; methods of sampling, inspection and test, and also provide for provision of retest and appeal in case of rejections.

6. OTHER ACTIVITIES OF EIC TO FACILITATE MARINE PRODUCT EXPORTS

In addition to the activity of marine product certification, EIC is also certifying other products for exports with focus in the food sector. With the concept of equivalence having been recognized in the SPS Agreement as well as being encouraged at the international level by the Codex Alimentarius Commission, EIC is emphasizing on development of equivalence Agreements with major trade partners. This would serve as an important means of facilitating trade by recognition of our standards and certification systems to provide an equivalent level of protection against health risks as those of the importing country. This would also ensure that duplication of testing at importing end is reduced and rejection accompanied by high cost of recalls is avoided. EIC has already been designated as Competent Authority by the European Commission for marine products and basmati rice and is awaiting recognition for egg and milk products. EIC has further initiated equivalence Agreements with Australia (AQIS), USA (USFDA), and has entered into dialogues for the purpose with Canada, Argentina, Italy, Srilanka and Japan.

Another major priority area for EIC is upgradation of modernisation of its four laboratories at Mumbai, Chennai, Kolkatta and Kochi as well as field labs attached to sub-offices, which are doing testing in the marine sector. These have been upgraded and instruments like Spectrophotometer. Gas Chromatograph, HPLC, low temperature Incubator (BOD) etc, have been installed in the four major laboratories. The laboratories are also being upgraded for accreditation as per international systems requirements. Inter and intra calibration tests are also being carried out by the EIA laboratories to verify the accuracy of tests performed. EIC is also in the process of approving external laboratories, which are capable of testing water, ice etc. for all parameters as per national, international and EC requirements.

This paper was presented during the Seminar on European Quality Standards for Fish and Fishery Products.

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Export Of Marine Products To The EU From India

By K Jose Cyriac
Chairman, MPEDA, Cochin

At the outset let me thank the Embassy of France in India and European Business Information Centre, India in organizing the Seminar on European Quality Standards for- Fish & Fishery Products jointly with the Cochin Chamber of Commerce & Industry, Seafood Exporters Association of India, EIC, K-BIP and MPEDA. This seminar is the first of its kind being organized in India by Embassy of India, France and EBIC.

Recognizing quality control, as the critical factor and the most indispensable element of export of seafood to sophisticated international markets, particularly to the European Union, today's seminar focuses mainly on the testing systems and European methods of quality control.

I shall now briefly explain the Indian scenario, with particular reference to our exports to EU.

As we are all aware, there is substantial increase in the consumption of seafood worldwide, mainly due to consumers' confidence in its nutritional benefits and wholesomeness. It is expected that the demand for seafood, particularly in diversified value added forms (such as convenience products), would grow further with the spread of health conscious lifestyles around the world. Suppliers of seafood in developing countries like India, will be able to expand their business considerably by adopting diversified seafood processing in value added forms ensuring safety of the product. This is of vital importance in view of the changing consumer preference and consumption pattern, which calls for innovative processing & packaging technology as also trading practices. The future of Indian seafood trade depends on optimization of raw material to produce higher percentage of value added products. Today, only about 15 - 20% of our exports are in value added form.

In developing countries, fisheries play a significant role in the economy by serving as a source of protein, as a sector providing maximum employment opportunities (next to agriculture) and as a source of foreign exchange. Fisheries constitute renewable resources and harvesting on sustainable level ensures sustainable returns.

In developing countries, fisheries play a significant role in the economy by serving as a source of protein, as a sector providing maximum employment opportunities and as a source of foreign exchange.

In India, we have 344 seafood processing establishments actively engaged in seafood processing for export of which 107 establishments are approved for export of their fish and fishery products to the European Union. In addition, there are 8 freezer vessels as well engaged in processing products for exports to EU. India's share of import of fish and fishery products into the EU is on the increase for the past few years and during the year 2000-2001 it was to the tune of 68,827 tons valued at 225.37 million US dollars. Our export to France during the period accounts for 5515 tons worth of 15.9 million US dollars. France occupies fifth position among the Member States in respect of Indian seafood export.

At this juncture, it is worthwhile to recall a little bit of the past incidents pertaining to our exports to the European Union. During July 1991 the European Commission had announced the Council Directive No.911 493/EEC, laying down the health conditions for the production and placing of fishery products on the European market. The provisions under the Directive apply to all member countries of the European Union as also third countries, including India. The seafood processors were required to meet various conditions under the Directive latest by, June 1997. However, subsequent to the inspection held by the EU officials in June 1997, a ban was imposed on import of fish and fishery products from India. To overcome the situation, concerted efforts were made by all concerned, and as desired by the Commission, the Government of India has identified the Export Inspection Council of India as the Competent Authority and an agreement was entered into between the Govt. of India and the EU Authorities in processing / trading of fish and fishery products. Upgradation and renovation of several units were undertaken on a war footing and based on a subsequent inspection held by the EU inspectors, the ban on import of fish and fishery products was lifted during December 1997, approving 10 seafood processing establishments for export of their fish and fishery products to the EU. Since then, with the staunch support of the Government

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authorities (both promotional and regulatory authorities) and active co-operation of the seafood processing fraternity, we have today around 115 seafood processing establishments approved for export of their fish and fishery products to the European Union.

In fact, the EIC has constituted a two-tier inspection system for approval of establishments for export of their products to the European Union. First is the Inter-Departmental Panel (IDP) wherein there are members from EIA, CIFT and MPEDA. The observations / findings of the IDP are being audited by a Supervisory Audit Team (SAT) consisting of two senior technically qualified officers, one each from MPEDA and CIFT. Only after SAT recommends the unit for approval, Director, EIC forwards the name of such establishments to the European Commission for issuance of necessary notification. Now, India has emerged in List - I of the countries listed by the European Commission whereby the frequency of border checks at EU Ports is considerably reduced as compared to those in List - II, published in the official journal of the European Communities. Many more Indian seafood processing establishments are in a transitional stage in upgrading and modernizing their facilities for getting their units also approved by the Competent Authority and the European Commission.

It is a welcome gesture at this point of time that the Embassy of France in India and EBIC has come forward in organizing a seminar like this to enhance the Indo-EU business.

Among various set goals in this regard, like enhancing awareness of European norms amongst Indian exporters of marine products, application of the EU norms by the member States, suggesting methods to increase export capabilities etc., the seminar also envisages in preparing Indian companies to participate in the proposed buyer-seller meet organized by the French authorities during the first quarter of 2002. This is an excellent opportunity for our seafood exporting fraternity who should reap maximum benefit out of it.

We have important sessions on subjects like the 'EU Quality Control & Testing Systems' and 'EU Complaint Handling & Appeal Procedures' etc. Coming to the quality complaints, as we all know, there exists a System of Rapid Alert for food under which the member States of the European Union exchange information on foodstuff, which may pose health hazards and, therefore, are subjected to detention. As one among the major suppliers of seafood to the European Union, we do export substantial quantities of seafood (last year it was about 68,800 tons) and also get quality complaints at times against our exports. During last year, there were 10 such complaints from the entire European Union (with regard to France, there were two complaints). We have noticed that some of these complaints have been proved baseless upon testing the products recalled (not only in the tests performed by the processors concerned but even by outside agencies). In this context, I would like to emphasize the need for an appeal procedure in such cases. Of course, there are instances of genuine complaints and we do have a system / procedure to be followed in handling such complaints received, in order to back track !he source of contamination, so as to prevent such occurrences in future. However, if a complaint is not established against a processor, there should be a system for an appeal. Here again it is to be ascertained as to how the difference occurs in test results; either it could be due to the different testing procedures being followed by the processor and by the Health Inspectors at border check posts or due to the different sampling procedures being adopted by them. There should be transparency in both the cases. Similarly, presence of certain micro-organisms in very limited numbers, which are commonly found in coastal and estuarine waters, for example, Vibrio parahaemolyticus is a matter of great concern among some member States. In fact, the presence of non-pathogenic strains of these organisms in very limited numbers in raw products is not a matter of concern at all as it can be totally eliminated during the process of cooking. In the context of a couple of complaints received in this regard, we have alerted our seafood processor exporters to adopt necessary control measures to prevent the presence of this micro-organism in consignments of seafood exported. However, it will be appreciated, if the member states could furnish the testing methodology and the permitted level of the presence of such micro-organisms in raw products as notified by them.

I hope, the sessions on 'Quality Control & Testing systems' and 'EU Complaints Handling and Appeal Procedures' would throw more light on the subject and our seafood exporting community present here would interact with the experts on the subjects to clarify their doubts on these issues.

It is our request, in this context, that the norms for sampling and testing by the European member states may be made more transparent so that the same procedure / methodology can be adopted by the processors concerned to avoid situations leading to unpleasant quality complaints. It is also my request to the Indian seafood processing community that they must acquire first hand information and exposure through this kind of seminar and equip themselves in maintaining equivalence of standards as required by the European member States concerned.

This paper was presented during the Seminar on European Quality Standards for Fish and Fishery Products.

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Principles for the establishment and application of microbiological criteria for foods

Introduction

These Principles are intended to give guidance on the establishment and application of microbiological criteria for foods at any point in the food chain from primary production to final consumption.

The safety of foods is principally assured by control at the source, product design and process control, and the application of Good Hygienic Practices during production, processing (including labeling), handling, distribution, storage, sale, preparation and use, in conjunction with the application of the HACCP system. This preventive approach offers more control than microbiological testing because the effectiveness of microbiological examination to assess the safety of foods is limited. Guidance for the establishment of HACCP based systems is detailed in Hazard Analysis and Critical Control Point System and Guidelines for its Application (Annex to CAC/RCP 1-1969, Rev. 3-1997).

Microbiological criteria should be established according to these principles and be based on scientific analysis and advice, and, where sufficient data are available, a risk analysis appropriate to the foodstuff and its use. Microbiological criteria should be developed in a transparent fashion and meet the requirements of fair trade. They should be reviewed periodically for relevance with respect to emerging pathogens, changing technologies, and new understandings of science.

1. Definition of microbiological criterion

A microbiological criterion for food defines the acceptability of a product or a food lot, based on the absence or presence, or number of microorganisms including parasites, and/or quantity of their toxins/metabolites, per unit(s) of mass, volume, area or lot.

2. Components of microbiological criteria for foods

2.1 A microbiological criterion consists of:

- a statement of the microorganisms of concern and/or their toxins/metabolites and the reason for that concern (see 5.1);
- the analytical methods for their detection and/or quantification (see 5.2);
- a plan defining the number of field samples to be taken and the size of the analytical unit (see 6);
- microbiological limits considered appropriate to the food at the specified point(s) of the food chain (see 5.3);
- the number of analytical units that should conform to these limits.

2.2 A microbiological criterion should also state:

- the food to which the criterion applies;
- the point(s) in the food chain where the criterion applies; and
- any actions to be taken when the criterion is not met.

2.3 When applying a microbiological criterion for assessing product, it is essential, in order to make the best use of money and manpower, that only appropriate tests be applied (see & 5) to those foods and at those points in the food chain that offer maximum benefit in providing the consumer with a food that is safe and suitable for consumption.

3. Purposes and application of microbiological criteria for foods

3.1 Microbiological criteria may be used to formulate design requirements and to indicate the required microbiological status of raw materials, ingredients and end-products at any stage of the food chain as appropriate. They may be relevant to the examination of foods, including raw materials and ingredients, of unknown or uncertain origin or when other means of verifying the efficacy of HACCP-based systems

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and Good Hygienic Practices are not available. Generally, microbiological criteria may be applied to define the distinction between acceptable and unacceptable raw materials, ingredients, products, lots, by regulatory authorities and/or food business operators. Microbiological criteria may also be used to determine that processes are consistent with the General Principles of Food Hygiene (CAC/RCP 1-1969).

3.1.1 Application by regulatory authorities

Microbiological criteria can be used to define and check compliance with the microbiological requirements.

Mandatory microbiological criteria shall apply to those products and/or points of the food chain where no other more effective tools are available, and where they are expected to improve the degree of protection offered to the consumer. Where these are appropriate they shall be product-type specific and only applied at the point of the food chain as specified in the regulation.

In situations of non-compliance with microbiological criteria, depending on the assessment of the risk to the consumer, the point in the food chain and the product-type specified, the regulatory control actions may be sorting, reprocessing, rejection or destruction of product, and/or further investigation to determine appropriate actions to be taken.

3.1.2 Application by a food business operator

In addition to checking compliance with regulatory provisions (see 3.1.1) microbiological criteria may be applied by food business operators to formulate design requirements and to examine end-products as one of the measures to verify and/or validate the efficacy of the HACCP plan.

Such criteria will be specific for the product and the state in the food chain at which they will apply. They may be stricter than the criteria used for regulatory purposes and should, as such, not be used for legal action.

3.2 Microbiological criteria are not normally suitable for monitoring Critical Limits as defined in Hazard Analysis and Critical Control Point System and Guidelines for its Application (Annex to CAC/RCP 1-1969, Rev. 3-1997). Monitoring procedures must be able to detect loss of control at a Critical Control Point (CCP). Monitoring should provide this information in time for corrective actions to be taken to regain control before there is a need to reject the product. Consequently, on-line measurements of physical and chemical parameters are often preferred to microbiological testing because results are often available more rapidly and at the production site. Moreover, the establishment of Critical Limits may need other considerations than those described in this document.

Microbiological criteria are not normally suitable for monitoring Critical Limits as defined in Hazard Analysis and Critical Control Point System and Guidelines for its Application

4. General considerations concerning principles for establishing and applying microbiological criteria

4.1 A microbiological criterion should be established and applied only where there is a definite need and where its application is practical. Such need is demonstrated, for example, by epidemiological evidence that the food under consideration may represent a public health risk and that a criterion is meaningful for consumer protection, or as the result of a risk assessment. The criterion should be technically attainable by applying Good Manufacturing Practices (Codes of Practice).

4.2 To fulfil the purposes of a microbiological criterion, consideration should be given to:

- the evidence of actual or potential hazards to health;
- the microbiological status of the raw material(s);
- the effect of processing on the microbiological status of the food;
- the likelihood and consequences of microbial contamination and/or growth during subsequent handling, storage and use;
- the category(s) of consumers concerned;
- the cost/benefit ratio associated with the application of the criterion; and
- the intended use of the food.

4.3 The number and size of analytical units per lot tested should be as stated in the sampling plan and should not be modified. However, a lot should not be subjected to repeated testing in order to bring the lot into compliance.

5. Microbiological aspects of criteria

5.1. Microorganisms, parasites and their toxins/metabolites of importance in a particular food

5.1.1 For the purpose of this document these include:

- bacteria, viruses, yeasts, moulds, and algae;
- parasitic protozoa and helminths;
- their toxins/metabolites.

5.1.2 The microorganisms incuded in a criterion should be widely accepted as relevant – as pathogens, as indicator organisms or as spoilage organisms – to the particular food and technology. Organisms whose signifi-

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cance in the specified food is doubtful should not be included in a criterion.

5.1.3 There mere finding, with a presence-absence test, of certain organisms known to cause food borne illness (e.g. *Clostridium perfringens*, *Staphylococcus aureus* and *Vibrio parahaemolyticus*) does not necessarily indicate a threat to public health.

5.1.4 Where pathogens can be detected directly and reliably, consideration should be given to testing for them in preference to testing for indicator organisms. If a test for an indicator organism is applied, there should be a clear statement whether the test is used to indicate unsatisfactory hygienic practices or a health hazard.

5.2 Microbiological methods

5.2.1 Whether possible, only methods for which the reliability (accuracy, reproducibility, inter and intra-laboratory variation) has been statistically established in comparative or collaborative studies in several laboratories should be used. Moreover, preference should be given to methods which have been validated for the commodity concerned preferably in relation to reference methods elaborated by international organizations. While methods should be the most sensitive and reproducible for the purpose, methods to be used for in-plant testing might often sacrifice to some degree sensitivity and reproducibility in the interest of speed and simplicity. They should, however, have been proved to give a sufficiently reliable estimate of the information needed.

Methods used to determine the suitability for consumption of highly perishable foods, or foods with a short shelf-life, should be chosen wherever possible so that the results of microbiological examinations are available before the foods are consumed or exceed their shelf-life.

5.2.2 The microbiological methods specified should be reasonable with regard to complexity, availability of media, equipment etc., ease of interpretation, time required and costs.

5.3 Microbiological limits

5.3.1 Limits used in criteria should be based on microbiological data appropriate to the food and should be applicable to a variety of similar products. They should therefore be based on data gathered at various production establishments operating under Good Hygienic Practices and applying the HACCP system.

In the establishment of microbiological limits, any changes in the microflora likely to occur during storage and distribution (e.g. decrease or increase in numbers) should be taken into account.

5.3.2 Microbiological limits should take into consideration the risk associated with the microorganisms, and the conditions under which the food is expected to be handled and consumed. Microbiological limits should also take account of the likelihood of uneven distribution of microorganisms in the food and the inherent variability of the analytical procedure.

5.3.3 If a criterion requires the absence of a particular microorganisms, the size and number of the analytical unit (as well as the number of analytical sample units) should be indicated.

6. Sampling plans, methods and handling

6.1 A sampling plan includes the sampling procedure and the decision criteria to be applied to a lot, based on examination of a prescribed number of sample units and subsequent analytical units of a stated size by defined methods. A well-designed sampling plan defines the probability of detecting microorganisms in a lot, but it should be borne in mind that no sampling plan can ensure the absence of a particular organism. Sampling plans should be administratively and economically feasible.

In particular, the choice of sampling plans should take into account.

- risks to public health associated with the hazard;
- the susceptibility of the target group of consumers;
- the heterogeneity of distribution of microorganisms where variable sampling plans are employed; and
- the Acceptable Quality Level[3] and the desired statistical probability of accepting a non-conforming lot.

For many applications, 2 or 3 class attribute plans may prove useful.[4]

6.2 The statistical performance characteristics or operating characteristics curve should be provided in the sampling plan. Performance characteristics provide specific information to estimate the probability of accepting a non-conforming lot. The sampling method should be defined in the sampling plan. The time between taking the field samples and analysis should be as short as reasonably possible, and during transport to the laboratory the conditions (e.g. temperature) should not allow increase or decrease of the numbers of the target organism, so that the results reflect – within the limitations given by the sampling plan – the microbiological conditions of the lot.

7. Reporting

7.1 The test report shall give the information needed for complete identification of the sample, the sampling plan, the test method, the results and, if appropriate, their interpretation.

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3 The Acceptable Quality Level (AQL) is the percentage of non-conforming sample units in the entire lot for which the sampling plan will indicate lot acceptance for a prescribed probability (usually 95 per cent).

4 See ICMSF: Microorganisms in Foods, 2. Sampling for Microbiological Analysis. Principles and Specific Applications, 2nd Edition, Blackwell Scientific Publications, 1986 (ISBN-0632-015-675).

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Freshwater Prawn culture in India

Present status and Future considerations

Rajeev Raghavan. P*

Freshwater prawn culture was an unorganized sector till the recent past, but has been showing signs of development and the culture production has shown significant increase during the last five years.

Abstract

The Giant freshwater Prawn, *Macrobrachium rosenbergii* (de Man) is considered to be a candidate species for diversifying aquaculture in India due to its attributes favorable for culture including successful reproduction in captivity, established technique for larval rearing, good growth rate and survival, absence of major disease problems and also wide consumer acceptability and high market value. Also the recent spate of disease outbreaks in penaeid shrimp culture has forced farmers to keep away from marine crustaceans and invest in prawn. Freshwater prawn culture was largely an unorganized sector till the recent past, but has been showing signs of development and the culture production has shown significant increase during the last five years. The present paper gives an account of the present status of freshwater prawn culture in the country with regard to resources, seed production, grow-out, feeding, economics and marketing. The paper also discusses the constraints and prospects of this sector.

Introduction

An overview of the recent trends in global fish production brings out the growing importance of culture fisheries. From the level of a subsidiary fanning activity, aquaculture is presently one of the fastest growing enterprise within the agriculture sector. The world aquaculture production has now reached 42,770,75 MT (F.A.O. 2001) with China enjoying the first position. India, with its long history of fish and prawn culture is second only to that of China with a total production of 2,035,488 MT in 1999 (F.A.O 2001). Bulk of this production comes from the Indian Major Carps and exotic carps with substantial contributions from cat fishes and also penaeid shrimps. Compared to various Asian countries, the aquaculture production in India is contributed by just 15 species. Although the country possesses vast potential in terms of resources and species, diversification of aquaculture has not been a reality in the country.

The Penaied shrimps, *Penaeus indicus* and *P.monodon* were the most important contributors to the aquaculture production during the late eighties and the early nineties. However since 1994 the culture industry in the country has been plagued by many problems including disease outbreaks which have almost crippled the sector, thus bringing down the share of cultured shrimps to the aquaculture production and thereby to the country's export market. In these circumstances the need for diversifying the aquaculture sector has become important so as to sustain the generation of additional raw materials for exports. Out of a variety of fin-fishes, crustaceans and molluscs available in the Indian waters, The Giant Freshwater Prawn, *Macrobrachium rosenbergii* (de Man) stands out as the most ideal species for aquaculture diversification in the country.

The freshwater prawns of the genus, *Macrobrachium* are distributed throughout the tropical and subtropical regions of the world and more than 25 species are listed under this genus from the Indian waters. Among them, only around ten species are of commercial significance since they support subsistence fishery in some region of the country or the other. They are *Macrobrachium rosenbergii* (de Man), *M.malcolmsonii* (H.Milne Edwards), *M.*

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choprai (Tiwari), *M.idella* (Hilgendorf), *M.rude* (Heller), *M.equidens* (Dana), *M.idae* (Heller), *M.scabriculum* (Heller), *M.mirabile* (Kemp) and *M.lammarrei* (H.Milne Edwards). Of these the first two, *M.rosenbergii* and *M.malcolmsonii* are considered as the ideal species for aquaculture in India. However the most important single species from the point of view of commercial aquaculture is *M. rosenbergii*.

Although the farming of the freshwater prawn on scientific and commercial lines was neglected until the recent past, it has been gaining tremendous popularity especially in the last 4-5 years. This has been mainly due to the persistent problems encountered by the shrimp farmers, which have forced them to raise an alternative crop. Scampi as *M.rosenbergii* is popularly known was found to be the best choice in the low saline areas where the intensive culture of Tiger Shrimps was carried out. *M.rosenbergii* is considered to be an ideal species for commercial aquaculture because of several desirable characters like a very fast growth rate (*M.rosenbergii* is the fastest growing natantain in the world) compared to penaeid prawns, hardiness and low protein requirement when compared to penaeids, disease resistance, compatibility, consumer preference and demand.

Status

The Giant Freshwater Prawn is cultured on commercial lines in many South East Asian and Asian countries including Thailand, China, Taiwan, Philippines, Vietnam, Malaysia, Indonesia, Bangladesh and India. Culture has also been reported from the U.S.A, Hawaii, Ecuador, Cuba and other countries in the Western Hemisphere. Freshwater prawn culture in India is largely an unorganized sector. Commercial culture as in the lines of carps and penaeid shrimp is not seen. Production trends during the last decade (1990-2000) show that only after 1997 has the sector been picking up in the country. Before that, only 1992 and 1994 showed somewhat considerable production figures. In 1998 the F.A.O estimated the production with regard to freshwater prawns from India at around 1507MT against a global production of around 1,25,000 MT (F.A.O 2000). According to the Marine Products Export Development Authority (M.P.E.D.A)- the national export promotion agency which is also actively engaged in promoting the freshwater prawn culture industry in the country, the annual scampi culture production of the country has registered a significant increase from 7I40MI in 1999-2000 to around 16,564Mt in 2000-2001. Andhra Pradesh is the largest producer followed by West Bengal and Kerala.

Table 1. Scampi production by culture in India (in MT)

State	1999-2000	2000-2001
West Bengal	1820	925
Andhra Pradesh	4410	14,515
Kerala	450	339
Tamil Nadu	40	80
Orissa	230	300
Karnataka	90	90
Gujarat	40	245
Maharashtra	60	70
Total	7140	16,564

Source: MPEDA

Resources

India has a vast area that is suitable for the culture of freshwater prawns. Around 5.4 million hectares of freshwater resources with over 171,334Km length of rivers and canals offer immense potential for the commercial level culture of freshwater prawns. Maritime states like Andhra Pradesh, Tamil Nadu, Orissa, Kerala, Karnataka, Maharashtra, West Bengal and Gujarat and many of the inland states like Uttar Pradesh, Bihar, Madhya Pradesh and Punjab have vast scope for promoting scampi culture. In Kerala, Kuttanad and the adjoining areas hold excellent potential with an area of 55,000ha for culturing scampi. Similarly, in Karnataka around 70,000ha of potential area spread over Raichur, Shimoga and Bellary districts have been identified for scampi culture. Apart from this, freshwater bodies spread across different states offer immense potential for culturing the freshwater prawn.

Seed Production

Slow progress in the freshwater prawn farming industry witnessed during the early 1990's was mainly attributed to the lack of availability of quality seeds for grow-out operations. Pioneering works on the seed production technology was carried out at the Central Institute of Freshwater Aquaculture (CIFA) and Central Institute of Fisheries Education (CIFE) where much of the important breakthroughs were made. A standardized hatchery technology for the species is now available and commercial level seed production has met with relatively high degrees of success. In India, there are around 35 hatcheries spread across five states of the country with a total installed capacity of 812 million seeds per annum. However the actual production accounts for only 200 million seeds per annum (Santhanakrishnan 2001). Andhra Pradesh has the highest number of scampi hatcheries (18) followed by Tamil Nadu (8) and Kerala (6). Even then there appears to exist a

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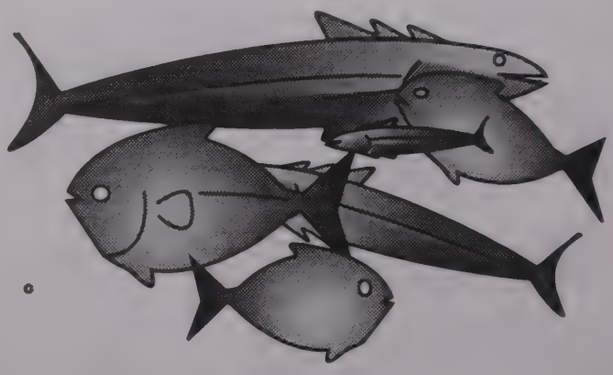

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serious shortage of seeds in states including Kerala and Andhra Pradesh and this has forced farmers to import seeds from various South-East Asian countries, thereby increasing the risk of pathogenic outbreaks. Further, low survival rates during larval rearing and the increasing cost of artemia cysts as larval feeds are also posing great concern for the hatcheries (Ayyappan and Jena 2001).

The ever-increasing demand for scampi seeds is thus a major problem for the culture sector in India. Even for 25% of the available ponds and tanks (0.5625million ha) to be brought under scampi culture, the seed requirement would be 28,115 million when stocked at the rate of 50,000 seeds/ha/crop in monoculture systems and 8437.5 million seeds per annum for polyculture systems with a stocking density of 15,000 seeds /ha/crop. At the present rate it would only be possible to produce X12million seeds per annum, that too if all the hatcheries work to their full potential. Thus there is a very large gap between demand and supply. Therefore a need has arisen for the establishment of commercial and backyard hatcheries both in the coastal and inland sectors. For the establishment of small hatcheries with a production capacity of 5 million seeds, a capital investment of about 2 million rupees is required (Suresh Kumar and Kurup 1996) and for a larger capacity of 24 million post-larvae, a capital of 4.4 million rupees is needed (Ponnuchamy 2000). It is worth mentioning here that in Thailand, a major producer of scampi the seed requirements for grow-out operations are met by a chain of backyard hatcheries. Therefore as a management strategy for augmenting seed production, it would be worthwhile to establish such backyard hatcheries in the different states of the country.

Grow-Out

Traditionally freshwater prawn farming has been a major activity in the Pokkali fields of Kerala and the Bheri's of West Bengal with freshwater prawn seeds brought into the coastal ponds as a result of tidal action being grown with various fin fishes and penaeid prawns. The commercial level grow-outs are mainly carried out in earthen ponds. The size of the ponds varies from 500 sq m to 1 ha with an average depth of 1-1.5mts. Most of the prawn farmers in India stock the post-larvae collected from the hatchery directly into the grow-out ponds. However some farmers rear the post-larvae till they reach the juvenile stage for about 30-40 days in nursery ponds. One of the main problems associated with stocking P/L directly into the grow-out ponds is the low survival rate. It is almost impossible to predict as to how many will survive until the harvest. Also the large size variations usually seen during the harvest can also be minimized by the adoption of this nursery phase. The ideal stocking density for the nursery rearing of *M.rosenbergii* has been found out to be about 500/sq m although varying densities from 200-400/sq m have been adopted by farmers in different regions.

Table 2. Scampi hatcheries in India

State	Number of hatcheries	Installed Capacity*
West Bengal	2	2
Andhra Pradesh	18	620
Tamil Nadu	8	115
Kerala	6	60
Maharashtra	1	15
Total	35	812

* Number of post-larvae per year (in millions)
Source: MPEDA

The biggest constraint faced by the farmers in the grow-out of scampi is the differential growth rate among different groups of individuals of a stocked population (Joice Abraham & Mohanskumar 2000) and also cannibalism. Prawns are sexually dimorphic as far as growth is concerned. Males grow faster than females and so uneven growth is more prominent among the male populations. Even in all male population of scampi, different morphophytes have been reported viz, Small Males, Weak Orange Clawed Males, Strong Orange Clawed Males, Pre-Transferring Orange Clawed Males, Weak Blue Clawed Males, Strong Blue Clawed Males and Old Blue Clawed Males. Due to the differential growth rates among the different morphophytes there will always be wide variations in sizes and different groups attain marketable sizes at different times. Because of this, batch culture with single stocking and single harvesting is not highly encouragable. Repeated stocking, induction of the above mentioned nursery phase and selective culling of early maturing females and fast growing males would be useful strategies in combating the differential growth rate seen in grow-out ponds of *M.rosenbergii*.

Andhra Pradesh is by far the biggest producer of cultured scampi in India with a production of 14,515MT in 2000-2001. Most of the culture is located in and around the Nellore district. Both monoculture as well as polyculture with major carps is practiced. To avoid the phenomena of differential growth seen during harvest, multiple culling techniques are adopted by the farmers, whereby an initial harvest is performed

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after 3-4 months after stocking to remove the Blue Clawed Males and the berried females. Thereafter a subsequent harvest is done after an interval of 30-45 days.

Kerala is another important producer of cultured Scampi in the country with a production estimated at 339MT in 2000-2001 (MPEDA 2001). Integration of paddy with freshwater prawn has turned out to be a viable alternative to effectively utilize the vast areas of derelict polders available in Kuttanad region of Kerala state. Around 5000 ha of the existing 54,000 ha of wetlands in the Kuttanad region are utilized for scampi culture as a follow up crop of paddy. Among them nearly 250 ha of fallow polders are utilized for polyculture with various Indian Major and Exotic carps. (Ranjeeth and Kurup 2001). In the monoculture ponds the nursery phase of 1-3 months is seen whereas such a phase is absent in the polyculture system. The stocking density and production from the scampi ponds are L5,000-60,000/ha and 300-1500kg/ha while in the polyculture system it is 5000-20,000/ha (prawn) and 5000-10,000/ha (fish) with productions ranging from 200-500kg/ha for prawns and 500-1500kg/ha for fishes.

In West Bengal, semi intensive culture of freshwater prawns is being carried out with productions ranging from 427-688 kg/ha/5 months. The total production from the state in 1999-2000 was estimated to be around 925 MT (Bhaumik 2001). Compared to West Bengal, the culture of freshwater prawn is only picking up in the various North Eastern states.

Farmers in Tamil Nadu are slowly switching over to Scampi to compensate the losses incurred due to disease outbreaks in penaeid shrimp culture. The transformation is particularly evident in the southern districts especially Thanjavur where many scampi farms have come up which are practicing both monoculture and also polyculture with various species of carps. The total production from the state is only around 80 MT eventhough there are around eight hatcheries producing scampi seeds in Tamil Nadu that has an estimated production capacity of 115 million seeds a year.

Maharashtra is slowly developing its freshwater prawn culture industry. In 2000-2001 the total production was estimated at around 70 MT. Until recently, the culture was mostly seasonal and a small-scale operation restricted to a short period in late summer and the onset of monsoon. Slowly, this is changing and monoculture of scampi is becoming quite popular in many parts of the state particularly in North Konkan. In North Konkan a rather distinct style of culture is also practiced where the Asian Sea Bass, *Lates calcarifer* and *M.rosenbergii* are cultured in earthen ponds. The ponds are stocked in June-July depending on the rains and Tilapia is let into the ponds as forage food for the Sea Bass (Sankoii and Shenoy 1994):

Although the farmers in the neighboring state of Gujarat had been somewhat slow in evincing interest in freshwater prawn culture this has changed within the last two years and in 2000-2001, the culture production has reached around 245 MT. Karnataka is also promoting its freshwater prawn culture industry in a strong way and this has resulted in a production of around 90 MT in 2000-2001.

Table 3. Economics of freshwater prawn-fish polyculture system in Thanjavur district (Tamil Nadu)

Capital costs	Excavation, bund, borewell, pump, sluice, aerators, store rooms, nets and accessories	2,09,000 Rs.
Production costs (Fixed cost/annum/ha)	Rent, interest on capital @ 15% depreciation on farm equipments/annum, repair and maintenance	53,315 Rs.
Variable cost (Crop/6 months)	Pond preparation, liming, fertilization, hide-outs, seed, nursery feed, grow-out feed, growth promoters, electricity, wages, salaries, water and cost of fish seeds	84,465 Rs. 1,68,930/annum (2 crops)
Returns		1,52,000/crop 3,17,000/annum (2 crops)
Rate of returns on capital		43.34% annum
Total cost: Total returns		1:1.70
Net profit		70 paise

Feeds and Feeding

As with the culture of various other aquatic animals, feeding is a critical aspect in the culture of scampi with feed costs alone making up to 50-60% of the operational costs. Prawn feeds are generally cheaper than shrimp feeds since Freshwater prawns require less dietary protein- a level of 25-35% compared to penaeid prawns, lipid level of 3-6% and Essential Fatty Acids, n 3 + n - 6 in their diets. Highly Unsaturated Fatty Acid levels as low as 0.075 % is said to increase growth by 50-60%.

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M.rosenbergii is an omnivorous feeder feeding on algae, nuts, gram, seeds, fruits, small crustaceans, fish flesh etc and like other crustaceans is coprophagous (New *et al.*, 1994). Farm made feeds made of various locally available ingredients were the most widely used feeds in freshwater prawn farms in India. But, these feeds are nutritionally inferior. This is because most of the farmers do not have an understanding about the nutritional requirements of these animals and the use of such feeds hampers growth. (Chand 1999). Slowly this is changing and several feeds have now been developed by the different research institutes and feed companies and are said to be giving encouraging results. A Farm made feed using indigenous feed milling technology and using locally available ingredients have been developed at the School of Industrial Fisheries at the Cochin University of Science and Technology and has been reported to be technologically and economically viable when compared to various other commercial scampi feeds available in the market (Hari and Kurup 2001). The feed is now being used in the commercial grow-out farms located in Kuttanad, which is the major center for freshwater prawn farming in Kerala.

Most of the hatcheries in the country use Artemia as the main feed for the larval rearing of *Macrobrachium rosenbergii* together with egg-custard and also other live feeds. Several commercial feeds (Microencapsulated and Microparticulate diets) have also been developed for use in scampi hatcheries.

Economics

Economic studies (both feasibility studies and case studies of existing farms) of Freshwater Prawn Farming have been undertaken in various regions of India. One such study (Senthilathiban *et al.*, 2001) was an economic appraisal of freshwater prawn farming in Thanjavur district in Tamil Nadu. According to the study, the returns after interest and depreciation were fairly impressive and realistic. The details of the study are given in table 3. An economic appraisal of freshwater prawn hatchery was given by Rao and Tripathi (1993). According to the study for a hatchery with an estimated installed capacity of 25 million P/L per annum, the capital cost required would be around 45 lakh Rupees with an operational cost of 15.52 lakhs. The net-profit would be 31.81 lakh after interest and depreciation with a rate of return of 70.69% on capital investment.

Marketing and Export

The market value of prawns is time, size and site specific.(New 1990). Though previously thought to be a product for local consumption, freshwater prawns are now increasingly entering export markets and are considered an important component of the marine export trade of several Asian countries including India. The export of frozen scampi has been showing a significant growth during the last 5-6 years. From around 1500 MT in 1994-1995 the export figures are now estimated at around 4756 MT in 2000-2001 valued at 245 Crore Rupees. The major markets for frozen scampi from India are The U.S.A, U.K, Belgium and the U.A.E.

Future

The culture of scampi, whose flavor and texture is thought by many to be superior to marine shrimps, may become an attractive but only as a partial alternative to the culture of penaeid shrimp. In India much of the potential for scampi culture has not yet been realized, although entrepreneurs in many states are investing in freshwater prawn.

Substantial expansion of this sector is expected, though the output will remain small in comparison with penaeid shrimp. With a rich treasure trove of freshwater resources that could be utilized successfully for the culture of scampi, many consider India as a sleeping giant in this sector.

The backwaters of Kerala and the adjoining paddy fields are considered as ideal resources for promoting scampi culture in India. The present production of the state at 339 MT is a far cry taking into account the potential of the state. The M.P.E.D.A has initiated scampi culture demonstration programmes in the Kuttanad region for standardizing and developing the commercial farming techniques of *Macrobrachium rosenbergii*. Several research institutes including the School of Fisheries at the Kerala Agricultural University and the School of Industrial Fisheries at the Cochin University of Science and Technology are stepping up its R&D activities on freshwater prawn breeding and culture. The School of Industrial Fisheries at the Cochin University of Science and Technology has entered into an exchange programme with Cantho University of Vietnam for technology transfer in the field of freshwater prawn larviculture.

Similarly, large areas in the southern districts of Tamil Nadu and Karnataka are suitable areas where large-scale culture of scampi could be attempted. The future of freshwater prawn farming though limited looks bright but requires dynamism for full realization of its potential. Developments in grow-out technology, especially in combating the problems of differential growth, nutritionally superior feeds (grow-out and larval feeds) and feeding techniques, better broodstock management with improvement through hormonal and genetic techniques, techniques for better storage, marketing and processing etc. should be the areas for immediate development so as to make scampi into the industry of the future.

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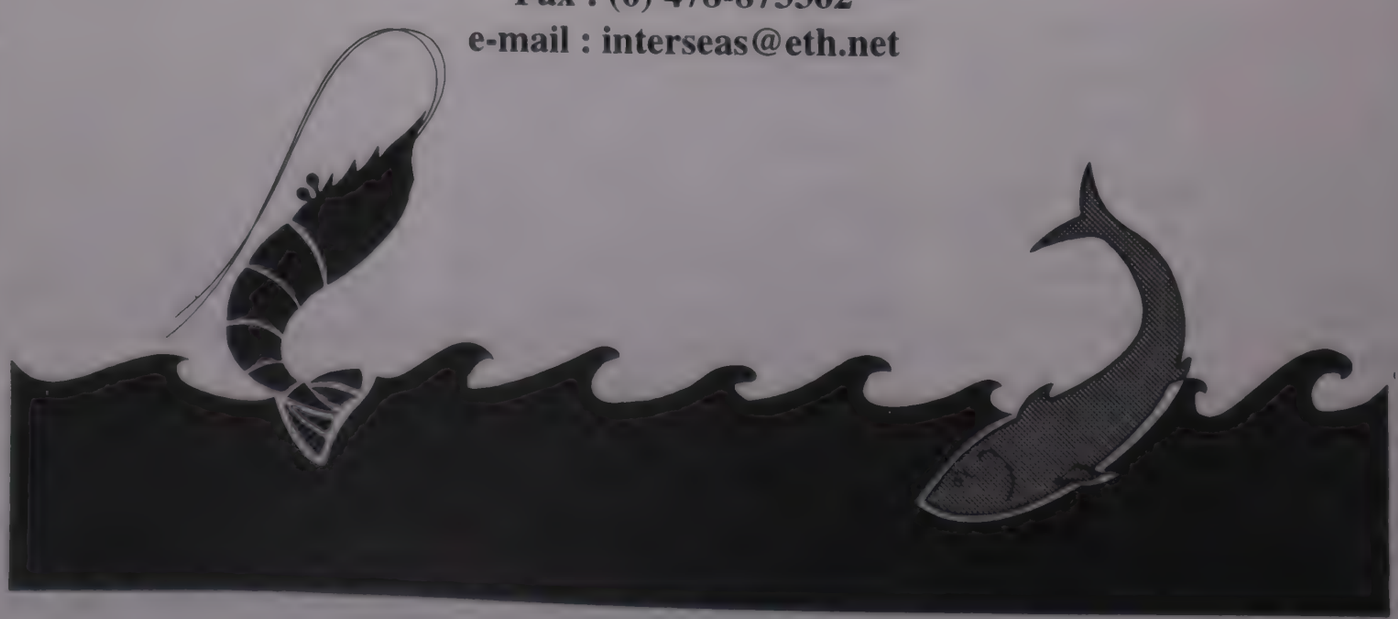
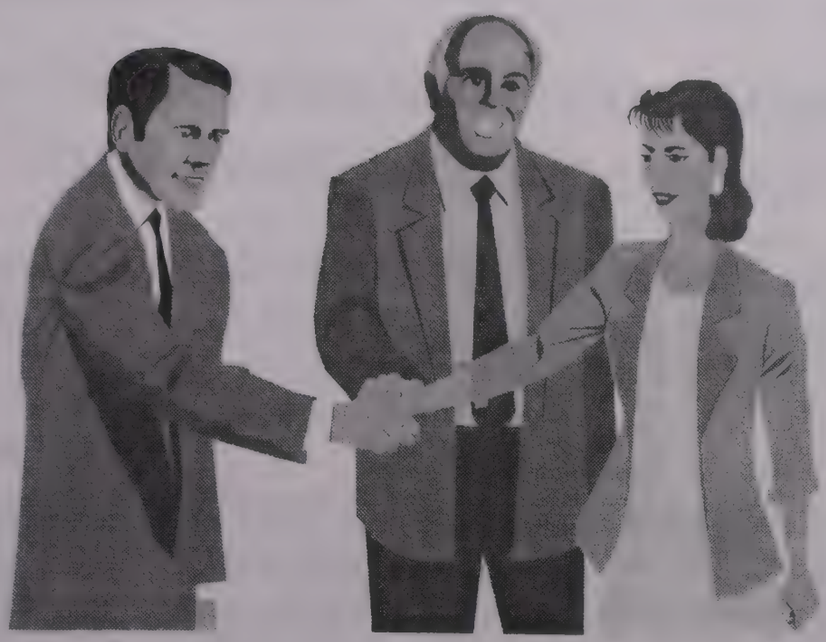


For the development of equivalence agreement of food import and export inspection and certification systems - Guidelines

Scope

1. This document provides practical guidance for governments desiring to enter into bilateral or multilateral equivalence agreements concerning food import and export inspection and certification systems. Such agreements may be binding instruments taking the form of "international agreements" under the Vienna Convention on the Law of Treaties, or they may be other less formal arrangements such as memoranda of understanding.



Section 2- Definitions

Audit is a systematic and functionally independent examination to determine whether activities and related results comply with planned objectives.[10]

Certification is the procedure by which official certification bodies and officially recognized bodies provide written or equivalent assurance that foods or food control systems conform to requirements. Certification of food may be, as appropriate, based on a range of inspection activities which may include continuous on-line inspection, auditing of quality assurance systems, and examination of finished products.[10]

Certification system means official and officially recognized certification systems.

Equivalence is the capability of different inspection and certification systems to meet the same objectives.[11]

Inspection is the examination of food or systems for control of food, raw materials, processing and distribution, including in-process and finished product testing, in order to verify that they conform to requirements.[10]

Inspection system means official and officially recognized inspection systems.

Official inspection systems and official certification systems are systems administered by a government agency having jurisdiction empowered to perform a regulatory or enforcement function or both.[10]

Officially recognized inspection systems and officially recognized certification systems are systems which have been formally approved or recognized by a government agency having jurisdiction.[10]

Requirements are the criteria set down by the competent authorities relating to trade in foodstuffs covering the protection of public health, the protection of consumers and conditions of fair trading.[10]

Section 3 – Purpose of agreements

Countries[12] may wish to enter into agreements[13] concerning food import and export inspection and certification systems to:

1. provide an enhanced means of assuring that exported products conform to importing country requirements;
2. Eliminate duplication of activities and use collective resources more efficiently and effectively;
3. Provide a mechanism for the cooperative exchange of expertise, assistance and information to help assure and enhance conformity with requirements.

Equivalence agreements are not generally intended as a condition for trade but rather as a means for ensuring that importing country requirements are met with minimal trade impediments. For example, such agreements may result in reducing the importing country's rate of physical checks or sampling to test against standards or to avoid additional certification in the country of origin.

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Section – 4 Scope and types of agreements

The guidelines herein are intended to cover both bilateral and multi-lateral agreements. Such agreements may cover trade in one or both directions between trading partners.

As agreed by the parties, an equivalence agreement covering control and certification systems may relate to any aspect of food safety or other relevant requirement for food. Such agreements may be limited to specific areas of trade or specific products. Such agreements may be entered into where equivalence has been established in respect of some or all requirements.

Equivalence agreements may include provisions for certificates or other forms of certification of particular traded products or may provide for dispensing with certificates and other forms of certification.[14]

Section – 5 Considerations before entering into bilateral or multilateral discussions

The importing country considers and determines whether the exporting country's measures meet the importing country's requirements. Any decision must, however, be made on the basis of objective criteria.

In general, significant resources are needed to develop agreements. Exporting and importing countries may therefore need to establish priorities for consultations leading to development of agreements in recognition of the limited resources available to conduct the necessary assessments. Such priorities should not conflict with World Trade Organization (WTO) rights and obligations.

Countries may wish to consider some or all of the following issues in setting priorities.

1. whether priority should be given to certain product categories because of the public health risks they pose;
2. whether there is significant trade between the exporting and importing countries for the product(s) that will be the subject of an agreement, and whether an agreement between the two countries would facilitate trade;
3. whether the exporting country appears to have sufficient infrastructure and resources to maintain an appropriate control system;
4. whether the exporting country's products have a low rate of non-compliance with importing country requirements;
5. whether the exporting country recognizes and abides by the Codex Code of Ethics in International Trade in Food;
6. whether significant resources would be conserved as a result of the agreement.

Section 6 – Initiating discussions toward an equivalence agreement

The country initiating discussion towards an equivalence agreement should identify:

1. the type of equivalence agreement proposed;
2. the product(s) to be covered;
3. the competent authority or authorities for each product; and
4. the scope of requirements to be addressed by the agreement (e.g., health and safety, quality assurance systems, labeling, consumer fraud, etc.)

A country which receives such an approach should respond in a timely manner.

A country entering into discussions towards an equivalence agreement should be prepared to facilitate assessment and verification activities both before and after conclusion of the agreement.

A country entering into discussions towards an equivalence agreement should be prepared to facilitate assessment and verification activities both before and after conclusion of the agreement.[15]

Countries that are not yet ready to enter into equivalence agreements may wish to work jointly toward the development of such agreements. Amongst other things, information exchange, joint training, technical cooperation, and the development of infrastructure and food control systems can serve as building blocks towards the later development of agreements. An importing developing country should consider providing technical assistance to exporting developing countries to establish systems that enable food exports to meet importing country requirements and facilitate the development of equivalent agreements.

In the event that the recipient of such an approach has difficulty in responding positively to the approach it should provide a statement of reasons and any relevant recommendations to facilitate the future development of equivalence agreements.

Both parties should verify that legal authority exists to discuss and enter into such an agreement.

Section – 7 Consultative process for equivalence agreements

As a first step in the consultative process, the importing country should make readily available the tests of its relevant control measures and identify the objectives of these measures. For food safety control measures, the importing country should identify the health risk(s) addressed by each measure. Where certain health hazards, such

as food borne pathogens, are known to exist in the exporting country and not in the importing country, these hazards and the measures to address them should be identified.

The exporting country should provide information that demonstrates that its own safety control system achieves the importing country's objectives and/or level of protection, as appropriate:

- Equivalence agreements for food safety (sanitary) control measures are entered into after an importing country determines that an exporting country's control measures, even if different from those of the importing country, achieve the importing country's appropriate level of health protection.
- Equivalence agreements for other relevant requirements for food are entered into after an importing country determines that the exporting country's control measures, even if different than those of the importing country, meet the importing country's objectives.

The development of equivalence agreements is facilitated by the use of Codex standards, recommendations and guidelines by both parties.

To facilitate the consultative process, information should be exchanged, as appropriate, on:

1. legislative framework, including the texts of all relevant legislation, which provides the legal basis for the uniform and consistent application of the food control system that is the subject of the agreement;[16]
2. control programs and operations, including the texts of all the exporting country's pertinent measures that would be the subject of the agreement, as well as other materials that relate to control programs and operations;[17]
3. decision criteria and action;[18]
4. facilities, equipment, transportation and communications as well as basic sanitation and water quality;[19]
5. laboratories, including information on the evaluation and/or accreditation of laboratories, and evidence that they apply internationally accepted quality assurance techniques;[20]
6. details of the exporting country's systems for assuring competent and qualified inspection[21] through appropriate training, certification, and authorization of inspection personnel; and the number and distribution of inspectors;
7. details of the exporting country's procedures for audit of national systems, including assurance of the integrity and lack of conflict-of-interest of inspection personnel;[22]
8. details of the structure and operation of any rapid alert systems in the exporting country.

A problem resolution procedure should be developed including provision for the importing country to re-examine products to verify that the exporting country has corrected its deficiencies.

Countries may wish to prepare side-by-side tables to organize the above mentioned information and identify differences between the countries' control systems.

The importing and exporting countries should identify a process for jointly considering differences in measures/requirements.

Representatives of the importing country should have the opportunity to satisfy themselves that the exporting country's control systems operate as outlined. This can be accomplished by appropriate assessment and verification of processes as described in Section 9 and the related Annex of the Guidelines for the Design, Operation, Assessment and Accreditation of Food Import and Export Inspection and Certification Systems.

Participants in the agreement should establish procedures to:

1. periodically audit and verify that equivalence continues to exist after conclusion of an equivalence agreement; and
2. resolve any problems identified during audit and verification.

A problem resolution procedure should be developed including provision for the importing country to re-examine products to verify that the exporting country has corrected its deficiencies.

The participants in the agreement should discuss and decide whether the equivalence agreement should include provisions for the use, in addition to or in lieu of certificates, of a list of establishments which have been shown to be in compliance with the exporting country's equivalent control measures. The importing country can use this list of establishments to monitor imported shipments. The exporting country would be responsible for providing the list, and updates when appropriate, to the importing country. The importing country retains the right to refuse imports from an establishment and to arrange with the exporting country the removal of an establishment from the list, providing reasons for its action.

Participants in the agreement should agree to procedures for information exchange in the event of a food emergency control situation.[23]

Participants in the agreement should agree to procedures to follow in the case of food shipments that are found not to comply with the terms of the

equivalence agreement.

Participants in the agreement should agree to procedures for terminating the agreement, in case either party is not satisfied that the terms of the agreement are being met.

To enhance public confidence in the agreement while respecting legitimate concerns to retain confidentiality, the relevant competent authorities of the particular countries should[24] provide the public-including consumers, industry, and other interested parties – an opportunity to comment at an appropriate time on the proposed content of the agreement.[25]

Section 8 – Pilot studies

Before entering into an agreement, the competent authorities in the importing and exporting countries may agree to the conduct of a trial or pilot study.

The pilot study draft agreement and protocol may include, but are not limited to, provisions in relation to:

1. description and time frame of the trial program.
2. roles and capabilities of involved government and officially recognized private organizations.
3. Procedures for inspection and certification.
4. Audit procedures and frequency.
5. Description of training or information needs.

Section 9 – Drafting the agreement

Information which may be included as appropriate in an agreement is listed in Appendix A.

Section 10 – Implementing the agreement

A notice announcing the agreement, or the text of the agreement itself, should be published by all the signatory governments. The text of the agreement should be made available to the public of each country in that country's official language(s).

After the agreement comes into effect, each party should promptly notify the other party of parties of any proposed new or revised measures that pertain to the agreement.

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10 Codex Alimentarius: Principles for Food Import and Export Inspection and Certification (CAC/GL 20-1995).

11 Codex Alimentarius: Guidelines for the Design, Operation, Assessment and Accreditation of Food Import and Export Inspection and Certification Systems (CAC/GL 26-1997).

12 For the purpose of these guidelines, "country" includes regional economic integration organizations to which a group of countries have transferred competencies as regards food import and export inspection and certification systems and/or the negotiation of equivalence agreements with other countries.

13 See Section I – Scope. Although this guideline refers to "countries" and "agreements," in many cases competent authorities will enter into agreements or other arrangements.

14 See paragraph 45 in CAC/GL 26-1997.

15 See CAC/GL 26-1997 for guidelines on the conduct of such assessment and verification activities.

16 See paragraphs 20-23 in CAC/GL 26-1997.

17 See paragraphs 24-29 in CAC/GL 26-1997.

18 See paragraphs 30-37 in CAC/GL 26-1997.

19 See paragraphs 38-40 in CAC/GL 26-1997.

20 See paragraphs 41-42 in CAC/GL 26-1997.

21 See paragraphs 43 in CAC/GL 26-1997.

22 See paragraphs 47 and 52-57 in CAC/GL 26-1997.

23 See Codex Guidelines for the Exchange of Information in Food Control Emergency Situations (CAC/GL 19-1995).

24 The delegations of Singapore, Uruguay, Vietnam, Malaysia and Egypt reserved their position on use of the word "should".

25 See paragraph 58 in CAC/GL 26-1997.

SUBSIDY FOR PROCESSING MACHINERY AND EQUIPMENTS

The Marine Products Export Development Authority is operating a scheme for extending subsidy assistance for various processing machinery and equipments for production of value added marine products. As per the scheme, the following items of machinery/ equipments are eligible for subsidy.

a) Complete machinery and equipments for production of Accelerated Freeze Dried Products.
b) Complete set of machinery and equipment for production of Surimi.
c) Any or all machinery and equipments for fish processing, such as washing, scaling, sorting, skinning, beheading, gutting, splitting, filleting, knobbing, meat separating, mincing, portioning, snap frying, electric drying etc.
d) IQF Freezer (Air-blow system, brine system, cryogenic system), trolley freezer, cooling and cooling systems, conveyer system, vibrator feeder, glazing unit, glaze hardening unit, refrigeration system for IQF, vacuum packing unit, automatic weighing system, machinery from 100 tonne cold storage, battering machinery, peeling deveining, gutting machinery etc.

It has now been decided to include the following machinery/ equipments required for production of fish curry in retort pouch also in the above list of machinery/ equipments for grant of subsidy under the scheme.

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Perhaps never before have the winds of change blown so strongly in the global tuna sector. Sashmi tuna consumption in Japan is on the decline while skipjack price was of great concern to vessel operators, canners and marketers alike.

The industry has nevertheless proven itself to be mature, dynamic and resilient in facing the challenges. New strategies were adopted to overcome the recent global skipjack tuna crisis. The industry has undergone restructuring through mergers and acquisitions, streamlining and relocating operations and aggressively exploring and developing new markets and new products.

Inspite of the ups and downs, tuna still maintains its position as number one fish product consumed in the US and its consumption has increased steadily over the last three years. Introduction of new products like tuna in pouch is expected to stimulate further consumption not only in the US but also in other markets. Meanwhile, preferences are changing in Japan, the world's largest sashimi tuna market where the middle aged and senior people still like raw, oily, red meat sashimi or tuna based sushi products, while the younger generation prefer cooked or grilled steaks and fillets of white meat albacore. As sushi restaurant outlets are expanding worldwide, the consumption of sashimi tuna is also growing rapidly in non-traditional markets.

Measures are being taken internationally to create more responsible tuna fisheries through concerted efforts.

Well, ***to put all the pieces together*** for a holistic view, it is time for the industry to meet again, share views, obtain first-hand information on the strengths and opportunities as well as discuss current problems and future prospects.

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Diversifying Freshwater Aquaculture in India with the culture of Snakeheads

K. KAMALRAJ and
RAJEEV RAGHAVAN. P*

Introduction

Aquaculture, the farming and husbandry of economically important aquatic organisms has made rapid growth in the last two decades and is presently one of the fastest growing enterprise within the agriculture sector. The global aquaculture production in 1999 was estimated at 42,770,975 MT (FAG 2001). India ranks second in the world aquaculture production with a total harvest of 2,03 5,488 MT in 1999(FAO 2001).

Aquaculture in India is mainly Carp based and various Indian Major Carps and exotic Carps constitute the bulk of the produce. Sectorwisc, freshwater aquaculture alone contributes to more than 80% of the total production. Murrels or *Channa* as they are popularly known in the country is a widely favored table fish in many of the states like Punjab, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Karnataka and Kerala. They are in high demand because of their high quality flesh and flavour which is considered ideal for rejuvenation and recuperation from serious illnesses. Murrels belong to the family *Channidae (= Ophiocephalidae)*. They are commonly referred to as snakeheads because the head of these fishes shows a very close resemblance to the head of a snake. This species form the bulk and mainstay of tank fisheries in peninsular India. Snakeheads are considered as potential species for the diversification of freshwater aquaculture in the country especially due to the high demand in the north and north-eastern states.

Global Scenario

Murrels have been regarded as valuable food fishes in the Far East and their flesh is claimed to have medicinal values. In Thailand, they are one of the most popular of food fishes. The most common type of culture practice is the pond culture of murrels, which has been in practice in many of the South-east Asian countries like Thailand, Vietnam and Cambodia. The grow out ponds range from 400-3200 m^2 with a depth of 1.5-2 m. The rearing system depends on adequate, good quality water which is supplied by gravity or by daily water exchange through pumping. Wild fry with an average length of 1.5-2 cm are stocked by weight at the rate of 0.1-0.4 Kg/m^2. Fry numbers vary from 80-800 fry/ m^2. This high stocking rate is preferred to compensate the losses due to diseases and cannibalism. The survival rate is fairly low (7-24%) and the period of culture varies from 7- 10 months depending on the stocking density and feed. The murrels are harvested at 500 - 1000 gm sizes. Production from successful operations can be as high as 8- 16 Kg/m^2/crop. In Kampuchea and Vietnam murrels are grown in cages moored near the shore. The cage sizes vary from 40-625m^3.

Indian Scenario

Murrels or the snake heads form a unique group of food fishes in freshwater habitats of India. Although reports of snakehead culture in the irrigation wells and canals in the Indian subcontinent are available, the technique has not been described in detail. India produced around 20,449 MT of murrels in 1999 (FAO 2001). Several species of murrels are found in India and are considered as an ideal species for diversifying freshwater aquaculture in India.

Species - Identity and Biology

Out of the different species of murrels found in India viz *Channa marulius* (Hamilton), *C. striatus* (Bloch), *C. punctatus* (Bloch), *C. gachua* (Hamilton), *C. leucopunctatus* (Skyes), *C. stewartii* (Playfair), only three species, *C. marulius*, *C. striatus* and *C.punctatus* are important from the culture point of view.

C. marulius - commonly called giant murrel is found in lakes, reservoirs, swamps and rivers. It grows to 120 cm in length and is highly predacious and cannibalistic. The breeding season is from March-October. Fecundity ranges from 2000- 4000. Floating eggs are laid in weed-infested areas, the emergent

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and the floating vegetations holding the eggs without dispersal.

C. striatus - commonly known as the striped murrel, it is the most common species found in India and the most important from the culture point of view. It grows to a length of 90 cms. They are highly predacious, feeding on fishes, frogs, tadpoles, insects and other live food. Breeding is continuous throughout the year with peak breeding season immediately preceding and during the monsoon. Fecundity ranges from 3000 to 30,000.

C. punctatus or the spotted murrel is a smaller species growing upto to 30cms in length. It abounds in stray pools, ditches, muddy water bodies etc. They feed on smaller fishes, insects, shrimps and occasionally molluscs. Sexual maturity is attained after it reaches the end of first year. Breeding starts in April and continues till October, Fecundity ranges from 3000 - 26,000.

Breeding and Culture

Snakeheads being highly predacious are generally suited to monoculture systems. Seed is collected from nature. The fry of 2-4 cms size can be collected all around the year from rain-fed ditches and shallow water bodies with abundant weeds. Fry of these species, under parental care move in shoals in search of food along the marginal areas of the breeding environment. While moving they make characteristic ripples at the water surface which can be easily noticed from a distance. The entire shoal can be collected easily when it is moving till the marginal weed-free areas, using a fine meshed net or other similar devices. Further, it is worth mentioning here that when the young reach the fingerling stage, they may not tend to move in schools. The fry of the Giant murrel, *C. marulius* can be recognized by its conspicuous orange-yellow band running laterally from the eye to the caudal fin. The characteristic ocellus appear on the caudal fin as a light dark spot surrounded by a orange hue. The fry of *C. striatus* has a bright red body with a reddish golden band and a dark black band from eye to the caudal fin. The fry of *C. punctatus* has a relatively dark colored body which is brownish black in color with a golden yellow lateral band and a mid-dorsal yellow line on the back.

Murrels have been successfully induced to spawn artificially by hypophysation with carp pituitary glands. Recently various studies in this regard have been taken up and has reported varying degrees of success.

One of the major constraints for popularizing murrel culture is the non-availability of adequate quantity of seeds. This can be overcome if more studies are initiated in this regard so as to develop a hatchery technology for the commercial level production of murrel seeds for grow out operations.

In murrel culture ponds, it is important to stock fingerlings rather than the fry. For this purpose, a nursery phase of 25-35 days should be maintained so as to train the fry to accept supplementary feeds. Studies on rearing of *C. striatus* spawn in cement nurseries showed varying survival levels ranging from 10.5 to 87.7 % with provision of different supplementary feeds.

For grow out of Channa Spp, the optimum stocking density varies from 20,000/ha (*C. marulius*), 30,000 ha (*C. striatus*) and 40,000 ha (*C. punctatus*) in semi- intensive culture operation and 40,000, 60,000 and 80,000/ha in intensive conditions. Unlike carp ponds, the inner side of bunds and ponds suitable for air breathing fish culture should either be firm with heavy log or wood or fenced with bamboo, cane or wire screens to a height of about 50 cms. This is essential so as to prevent the fishes from escaping by climbing or burrowing. (Santhanam *et al.*, 1987). An All India Coordinated Research Project on Air Breathing Fish Culture was initiated by the Indian Council of Agriculture Research (I.C.A.R) in 1971 and several studies have been carried out on the culture technologies for the different air breathing fishes including the snakehead. Experimenting with *C. striatus*, Dehradrai 1980 reported production levels of 713-895 Kg/ha/yr in experimental swamps with manuring and liming. In another experiment, with a stocking density of 10,000/ha production levels as high as 3200 kg/ha/yr were reported by feeding dried marine trash fish as supplementary feed. Culture of murrels in irrigation wells has been in practice in many states of peninsular India for many a years and has reported fairly good production rates. Also, the integration of murrel culture with bananas has been reported to be a profitable venture.

Feeding the murrels in grown out ponds has been an area of major concern. Unlike carps and various freshwater species murrels do not accept feeds in pelleted form. Also, the nutrient requirements for snakeheads are much less known than those for other air breathing species like catfishes. Murrels are strict carnivores, which is believed to have a high protein requirement. Minced trash fish is given as the sole feed for snakehead fry and is fed *ad libitum*, the feeding rate being adjusted after observing fish behavior during feeding. The fish are generally fed three times a day from fry to fingerling stage. The inclusion of trash fish in the feed can be reduced to 80% by the addition of rice bran 20% when the fish attain the fingerling stage. Feeding platform 2 X 0.5m, generally 4-6 in numbers are provided for placing the feeds. Experience with the Thai snakehead farmers shows that the trash fish used for feeding the fishes must be "daily fresh" or else the fish will not accept

the mixed feed. Polyculture of Tilapia with murrels with the former acting as forage food can also be a lucrative venture. Studies conducted at the Center for Aquaculture Research and Extension at the St Xaviers College, Palayankottai in Tamil Nadu reported good survival and growth when stripped murrel, *C. striatus* was fed with chicken intestine as the supplementary feed.

More studies need to be initiated in this field for developing cost effective and highly nutritious feed for snakeheads in order to develop the industry to a commercial scale in the country.

Marketable sizes of murrels can be obtained in 8-9 months on an average. *C. mavulius* is expected to attain 350-400 gm in 6-8 months, *C. striatus* 250-300 gm and *C. punctatus* 150-200 gm giving yields of 3000- 4000 kg/ha in semiintensive and 6000-8000 kg/ha in intensive culture.

Murrels are easily susceptible to the Epizootic Ulcerative Syndrome, which had affected a large number of freshwater fishes in many of the Asian countries including India in the early part of the nineties. Parasites, especially various ecto-parasites like *Costia* spp, *Trichodina* spp and *Chilodonella* spp are the major pathogens affecting murrels in a culture system. Branchiomycosis is another important disease seen in the giant murrel, *C. marulius.*

Snakeheads are generally sold fresh and live fishes fetch considerably higher prices than dead or frozen fishes. The processed varieties (salted/dried) fetch only around 40-50% of the price for live fishes. In India, live murrels fetch high prices and are in great demand in many peninsular and northern states.

Murrels have a considerably higher protein and lower fat content when compared to carp or Tilapia and therefore snakeheads can be considered to be more nutritive than these two species in the terms of a higher protein to fat ratio. Snakeheads are a luxury food fish served in restaurants and is also a cheap protein source for poor people. They are also significant in biological control of weed fishes and aquatic insects. Of late, some of the lesser known species of murrels like the Red SnakeHead *Channa micropeltes* has gained immense popularity as an indigenous ornamental fish.

In tropical countries like India where the available freshwater may be limited and dissolved oxygen concentration low, air breathing fishes may have a significant advantage for aquaculture as they can survive and grow in shallow water deficient in oxygen.

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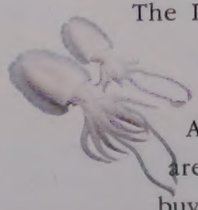

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